

Device Modeling Report

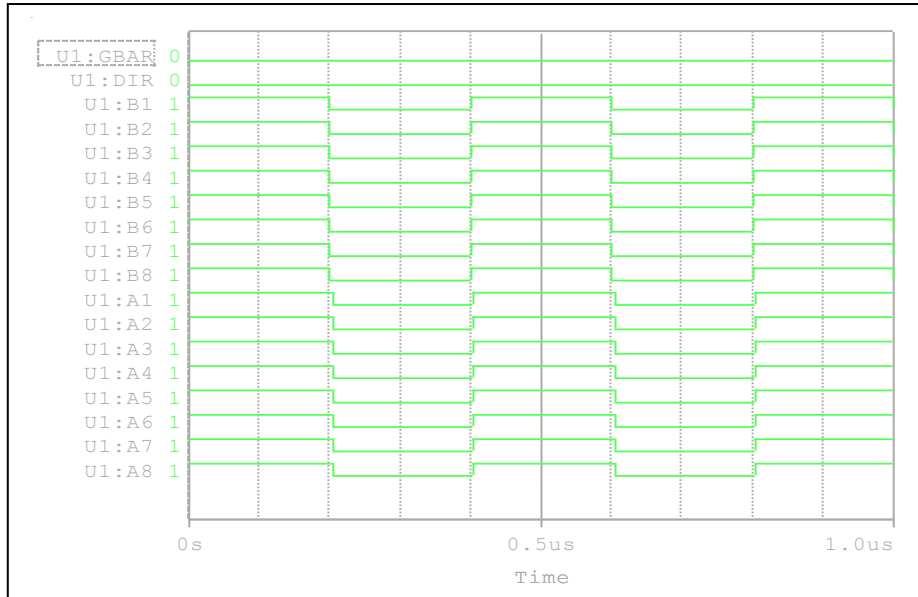
COMPONENTS : CMOS DIGITAL INTEGRATED CIRCUIT
PART NUMBER : TC74VHC245F
MANUFACTURER : TOSHIBA



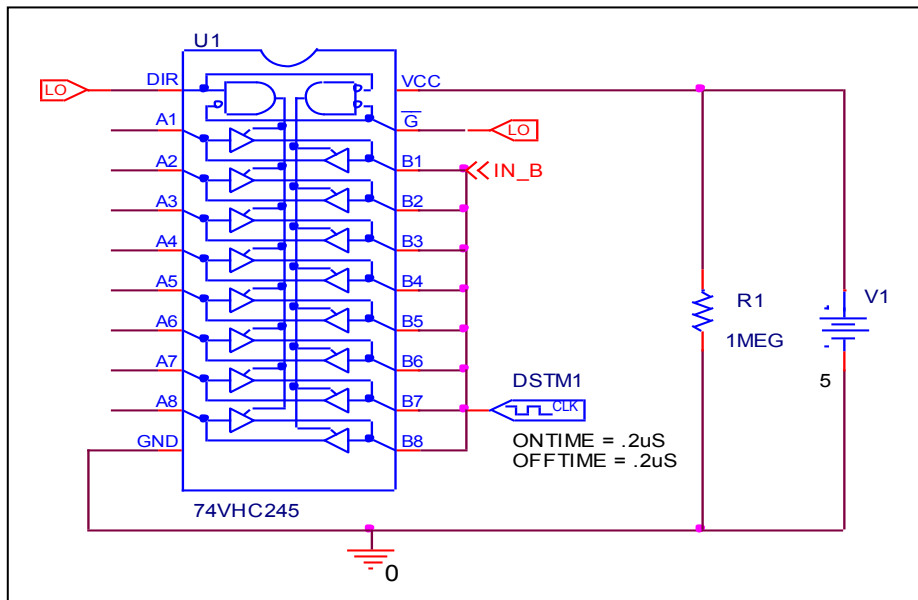
Bee Technologies Inc.

Truth Table

Circuit simulation result



Evaluation circuit



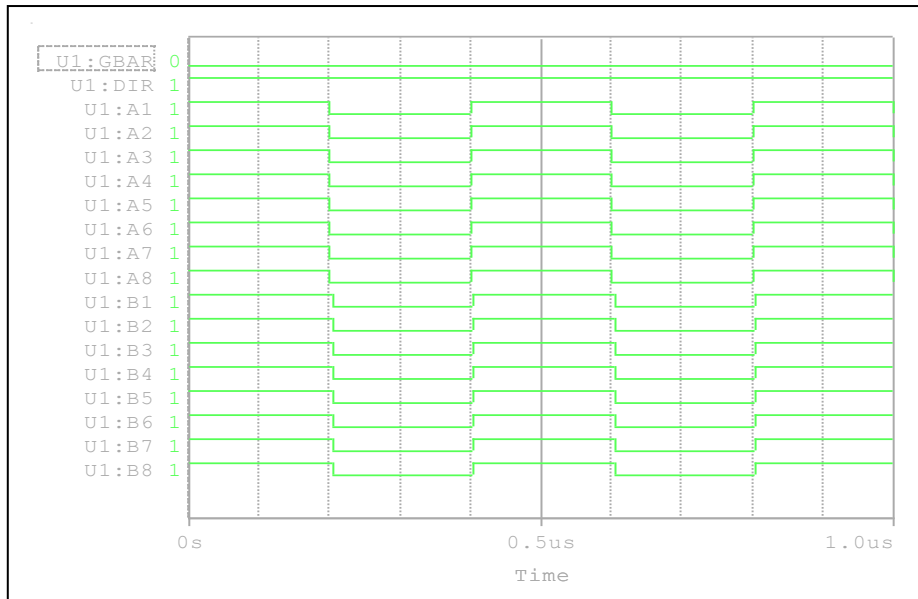
Comparison table

Function : A BUS = OUTPUT, B BUS = INPUT

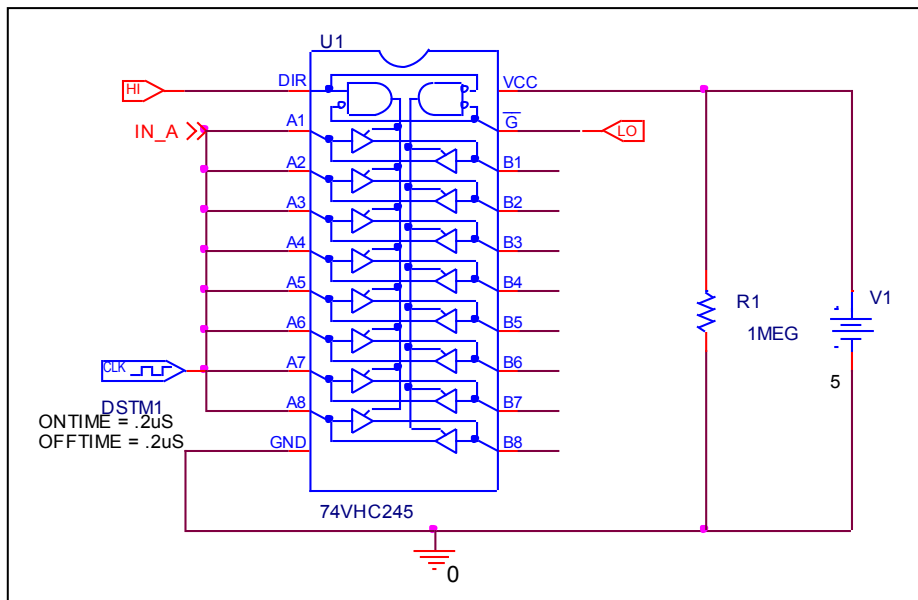
Input		Output		%Error
$\overline{G}$	DIR	Measurement	Simulation	
L	L	A=B	A=B	0

Truth Table

Circuit simulation result



Evaluation circuit



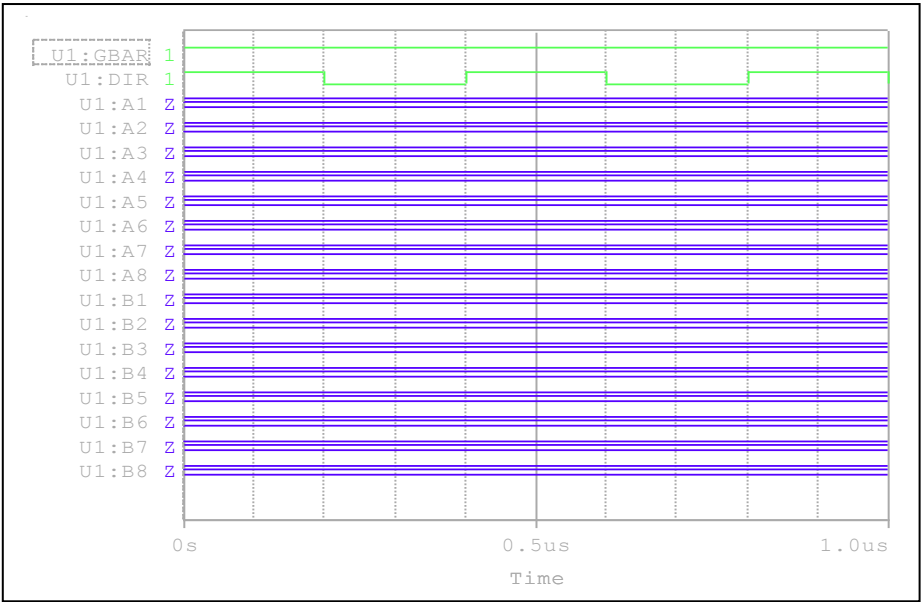
Comparison table

Function : A BUS = INPUT, B BUS = OUTPUT

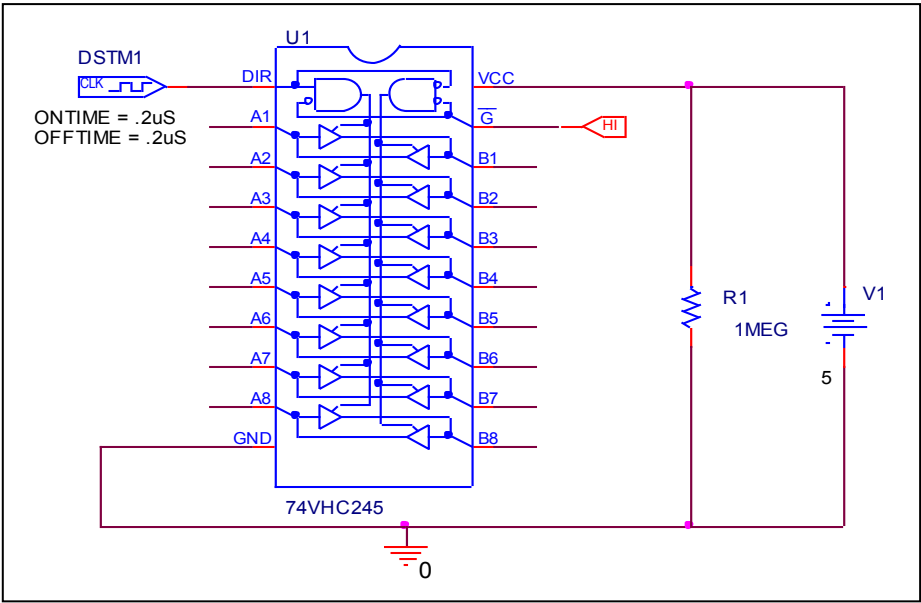
Input		Output		%Error
$\overline{G}$	DIR	Measurement	Simulation	
L	H	B=A	B=A	0

Truth Table

Circuit simulation result



Evaluation circuit



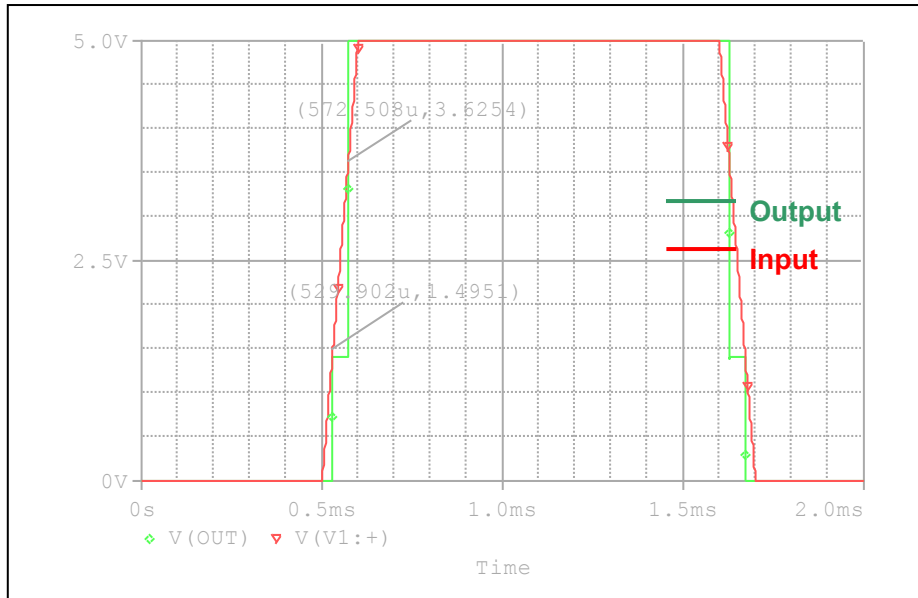
Comparison table

Function : A BUS and B BUS = HIGH IMPEDANCE

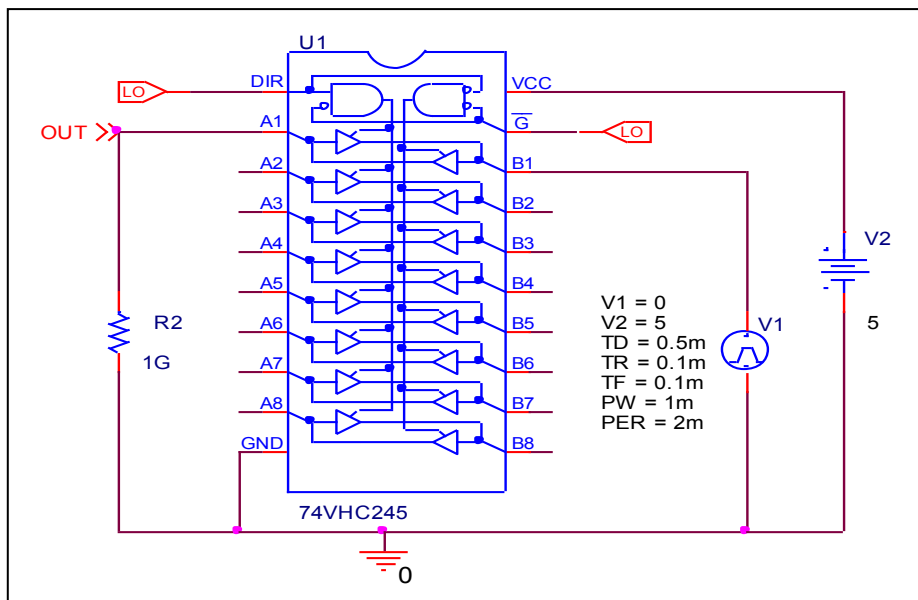
Input		Output		%Error
$\overline{G}$	DIR	Measurement	Simulation	
H	X	Z	Z	0

High Level and Low Level Input Voltage

Circuit simulation result



Evaluation circuit



Comparison table

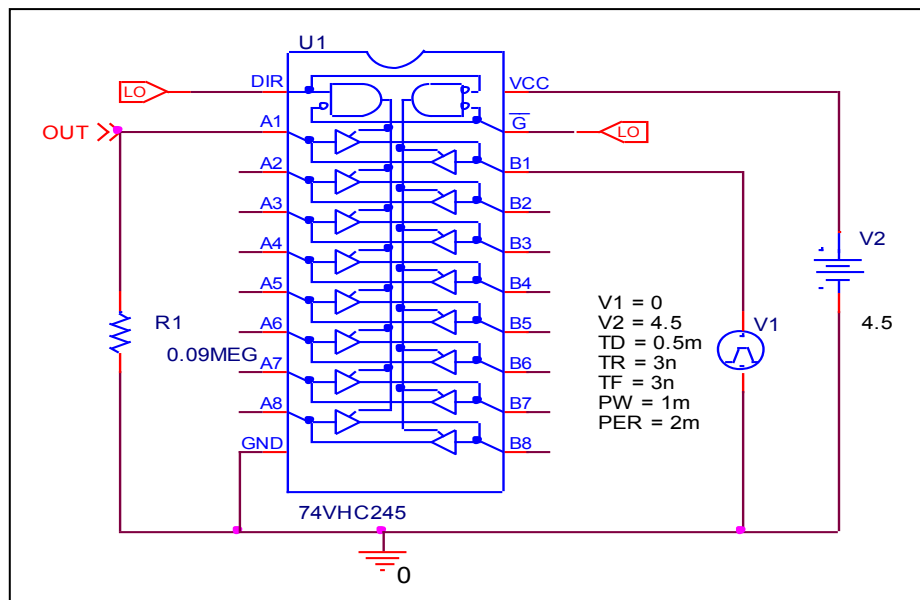
$V_{CC} = 5\text{ V}$	Measurement	Simulation	%Error
Min $V_{IH} = (V_{CC} \cdot 0.7)\text{ V}$	3.5	3.6254	3.583
Min $V_{IL} = (V_{CC} \cdot 0.3)\text{ V}$	1.5	1.4951	-0.327

High Level and Low Level Output Voltage

Circuit simulation result



Evaluation circuit

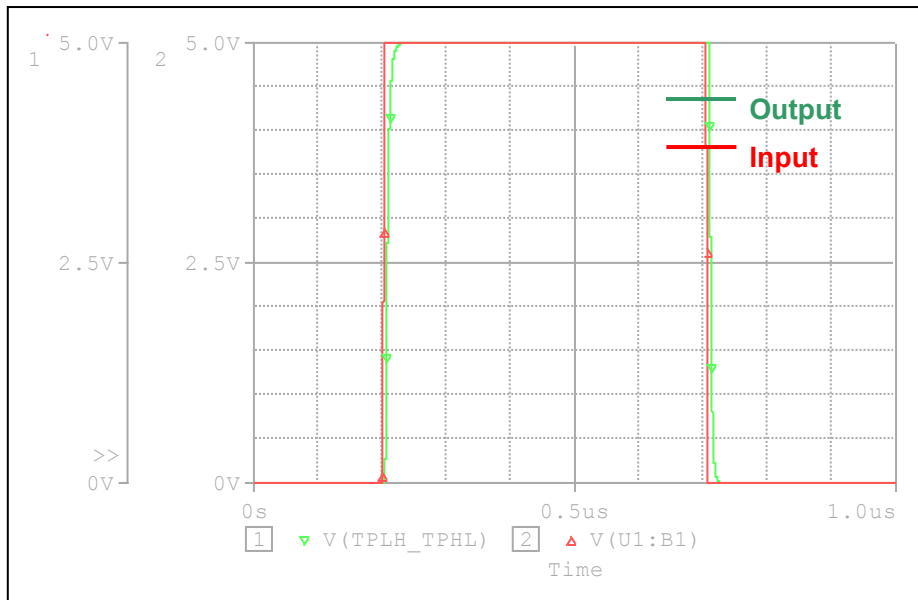


Comparison table

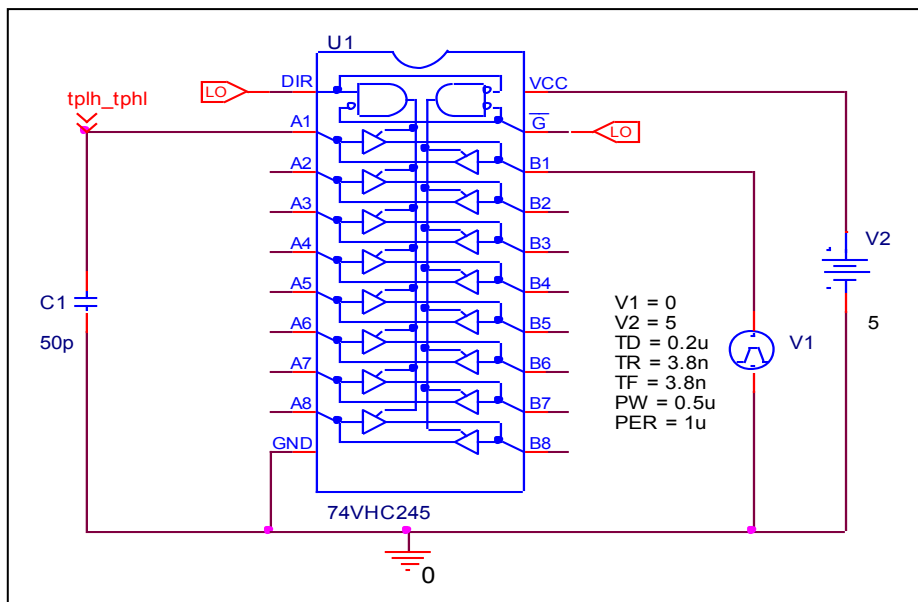
$V_{CC} = 4.5V$	Measurement	Simulation	%Error
$V_{OH} (V)$	4.5	4.4968	-0.071
$V_{OL} (V)$	0	0	0

Propagation Delay Time

Circuit simulation result



Evaluation circuit

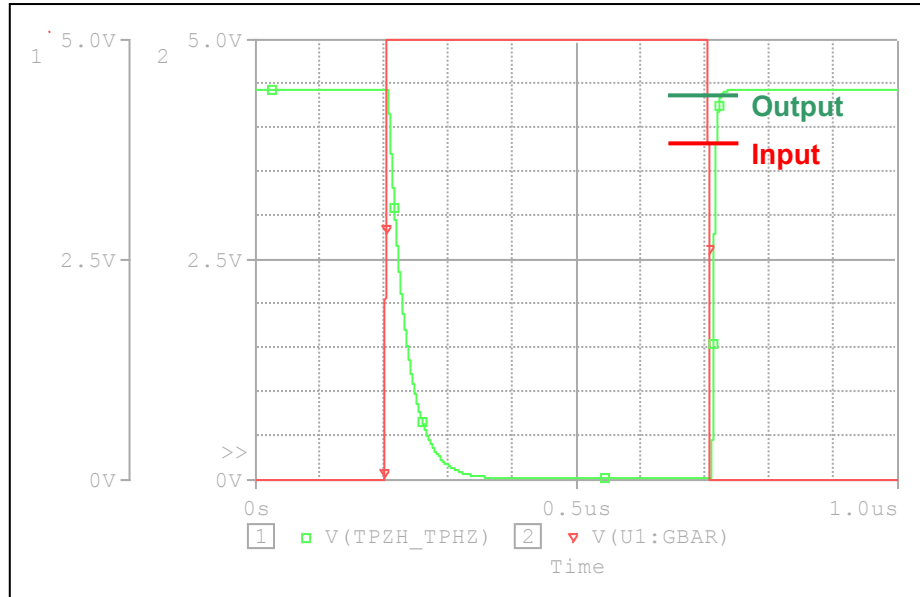


Comparison table $C_L = 50 \text{ pF}$

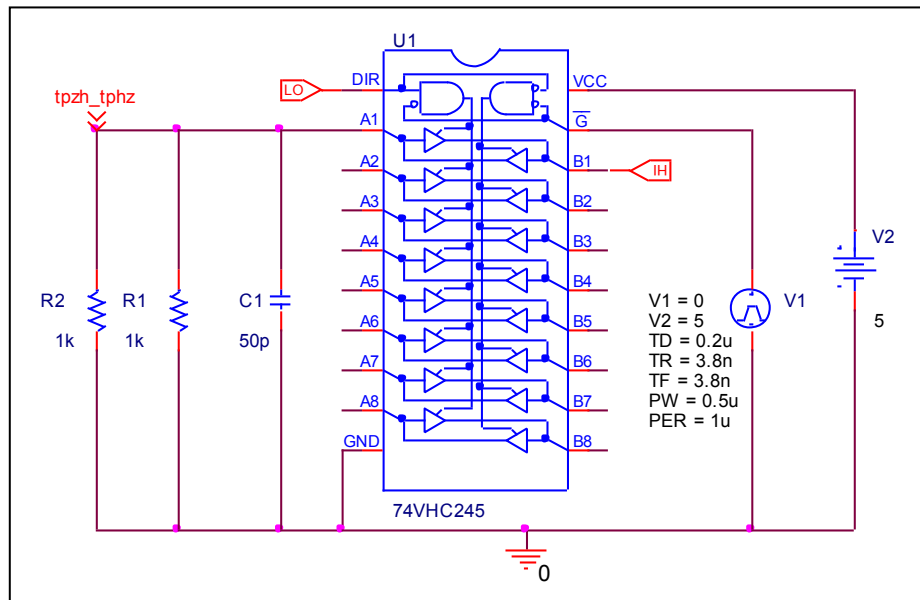
$V_{CC} = 5 \text{ V}$, $t_r=t_f = 3 \text{ ns}$	Measurement	Simulation	%Error
$t_{PLH} \text{ (ns)}$	5.5	5.5414	0.753
$t_{PHL} \text{ (ns)}$	5.5	5.5186	0.338

Output enable time, high impedance (off) to high output (t_{PZH})
Output disable time, high to high impedance (off) output (t_{PHZ})

Circuit simulation result



Evaluation circuit

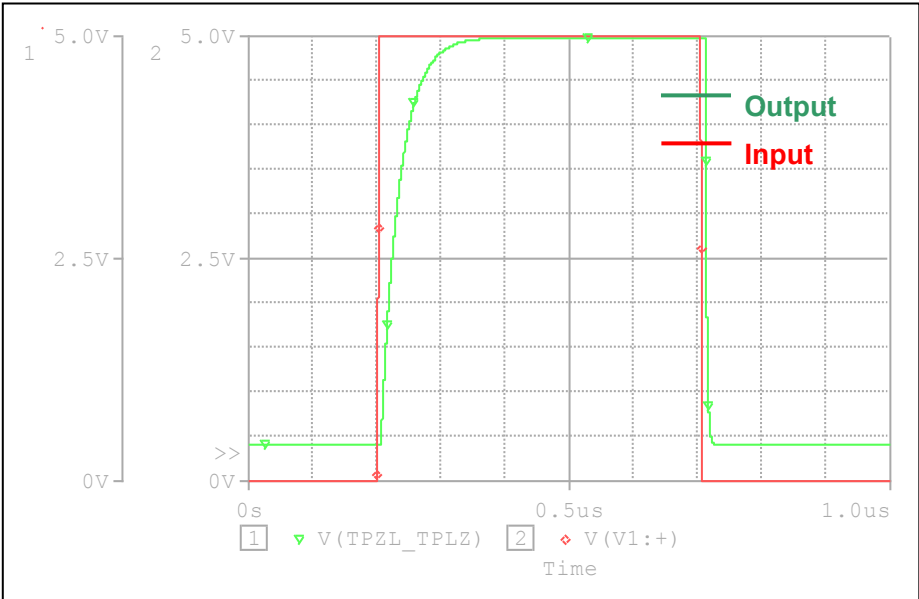


Comparison table $C_L = 50 \text{ pF}$, $R_L = 1 \text{ k}\Omega$

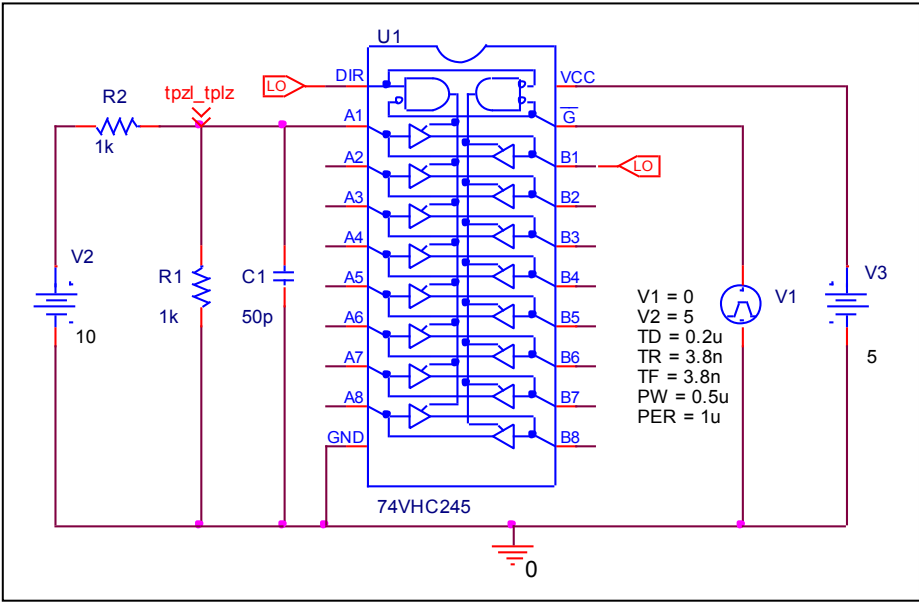
$V_{CC} = 5 \text{ V}$, $t_r=t_f = 3 \text{ ns}$	Measurement	Simulation	%Error
$t_{PZH} \text{ (ns)}$	7.3	7.3971	1.330
$t_{PHZ} \text{ (ns)}$	7	7.0539	0.770

Output enable time, high impedance (off) to low output (t_{PZL})
Output disable time, low to high impedance (off) output (t_{PLZ})

Circuit simulation result



Evaluation circuit



Comparison table $C_L = 50 \text{ pF}$, $R_L = 1 \text{ k}\Omega$

$V_{CC} = 5 \text{ V}$, $t_r=t_f = 3 \text{ ns}$	Measurement	Simulation	%Error
$t_{PZL} \text{ (ns)}$	7.3	7.272	-0.384
$t_{PLZ} \text{ (ns)}$	7	7.0956	1.366